Small Business Economic Impact Statement
Chapter 173-201A WAC
Water Quality Standards for Surface Waters
December 19, 2002

The proposed amendments to the Water Quality Standards for Surface Waters have been reviewed, based on a worst case scenario (greatest potential economic impact). Based on this approach, the proposal will have a disproportionate impact on affected small businesses.[*] This proposed amendment would revise water quality standards that (1) will affect some small and large businesses, and (2) that provide basic protections for the uses of waters in Washington. The proposed changes that will affect some businesses are associated with the following parts of the rule:

Antidegradation [Part III 173-201A-300 through 330]
Change to Use Based Standards for Fresh Water [contained in 173-201A-200, 600, 602]
Temperature Standards for Fresh Water [contained in 173-201A-200 (1)(c)]
Dissolved Oxygen Standards for Fresh Water [contained in 173-201A-200 (1)(d)]
Bacteriological standards [173-201A-200 (2) & 210 (2)]
Heat Plumes in Mixing Zones [173-201A-200(1)(c)]
Agricultural Water Supplies [173-201A-200 (3)(b)]

The majority of businesses will not be affected because activities under the current standards would be sufficient to comply with the proposed revisions. However, for any waterbody reaches affected by the proposed changes, and for which no variance, flexibility, or offset is possible, the proposed amendments would have a disproportionate impact on small business. Cost minimizing features have been provided in the rule.[†]

Uncertainty drove the decision to use a worst case analysis. The proposed rule only sets the standard and does not specify how a waterbody should meet that standard. Ecology would have needed further information in order to reduce the uncertainty in the analysis, including:

- Did the criteria on the waterbody change?
- Is the waterbody reach naturally limited?
- Will a permitee discharge a pollutant that involves a revised criteria?
- Will that permit need to be modified as a result of the criteria changes?

The mechanism used to meet the permit limit is chosen by business and not prescribed by Ecology. Ecology can not predict the options a business might choose. The determination that there will be a disproportionate impact is therefore based on a worst case analysis.[‡] Because of the uncertainties described above, Ecology estimated costs based on the most expensive management practices to meet the criteria changes and has assumed these activities are occurring on waterbodies that do not have additional assimilative capacity. It is not possible

[*] RCW 19.85.040
[†] RCW 19.85.030 (See Cost Minimization Section)
[‡] Other lower cost mechanisms also indicated a disproportionate impact.

to know the average impact of the rule. Ecology modeled worst case impacts for permitted facilities.[§] The modeled impact was disproportionate.

Ecology does not expect that nonpoint Best Management Practices will be affected by the change in the standards. Business related stormwater may affect water quality. However, Ecology's expectation is that the proposed changes to the standard will not require any substantive changes in currently accepted stormwater practices because current practices represent the best available methods for managing urban stormwater.[**] Timber and agricultural activities may affect stream temperature by removing cover. However, the practices that currently protect for water temperature and therefore dissolved oxygen should be so similar under the two versions of the rule that there would not be a measurable difference. (See Appendix C)

Legal Background

The proposed amendments to Chapter 173-201A WAC change the water quality standards for all of the surface waters in Washington. The standards set numerical limits on the allowable pollution for the state's waters and serves as the driver for control programs. Federal regulations require that the standards be reviewed and revised.[††] If a proposed rule change was driven entirely by state or federal law or regulation, it is not evaluated in this document. Appendix A provides a crosswalk of the current rule and the proposed changes and indicates which amendments create no substantial changes,[‡‡] which amendments are federal,[§§] and which create a significant rule change.

Description of Proposed Changes as They Affect Business

Small and large businesses may be affected by the proposed changes if they affect water quality in the following ways:

- direct point source discharge to water,
- various businesses discharge wastewater to POTWs (publicly owned treatment works), which in turn discharge to the waters of the state.

The following are brief descriptions of the rule changes.[***] A more detailed description of the proposed changes can be found in both the decision memos and the draft environmental impact statement which are both a part of the proposed rule package.

Proposed Antidegradation [Part III 173-201A-300 through 330]: This section has been rewritten and greatly expanded. However, the changes either: 1) are a form of cost reduction discussed

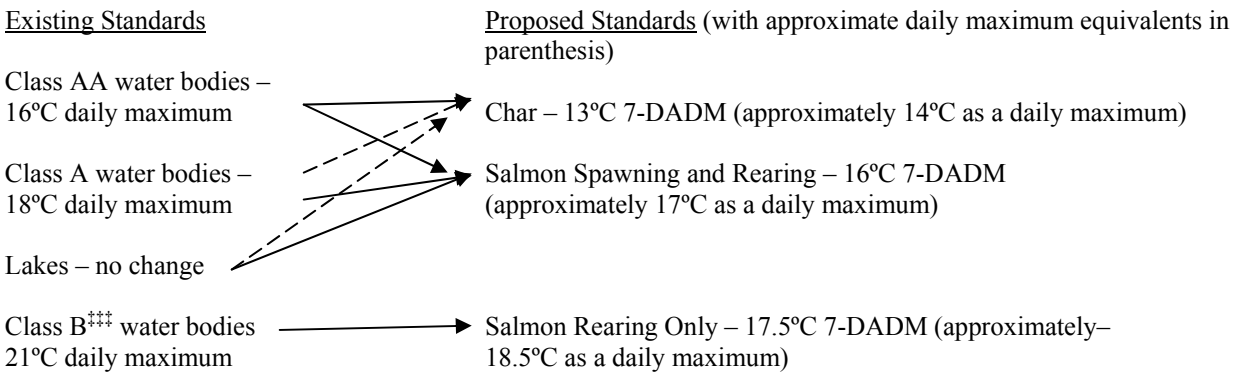
[§] Facilities with NPDES (National Pollution Discharge Elimination System) and Washington State permits.
[**] Bill Moore, Environmental Engineer, Water Quality Program, Department of Ecology.
[††] Changes were proposed in order to remain in compliance with the following federal regulations: CFR 131.10-Designated uses, CFR 131.11-Criteria, CFR 131.12-Antidegradation, CFR 131.2, CFR 13136-Toxics Criteria. Changes were proposed to comply with state Water Quality law 90.48. For the most part, Ecology's options are constrained by state law, the Clean Water Act and the Endangered Species Act.
[‡‡] Many of the changes are clarifications of administrative procedure. Even where there are substantive changes in the physical standards, the changes are relatively minor and will in general cause no change in compliance actions.
[§§] Federal requirements are exempt from analysis under RCW 19.85.025 (2).
[***] RCW 19.85.040 (1)

below under Cost Minimization;[†††] or 2) make requirements that are implicit in the existing rules explicit. Therefore no cost was modeled.

Use Based Format for the Standards [contained in 173-201A-200, 600, 602]: The proposed amendment shifts the classification system to a use basis. Uses are defined and the regulation applies the most stringent standards that support those uses in each case. The proposed classification system only has an impact on business through the change in the criteria (e.g. dissolved oxygen) and the change in the waterbody reaches (e.g. Class A to Char). Thus the proposed reclassification is analyzed through these changes. In the longer term, improved information will allow the deletion of certain uses from specific waterbody segments, potentially easing the long-term burden of the regulations.

Temperature standards [contained in 173-201A-200, 173-201A-210]: Temperature standards would be either reduced or increased for some fresh water reaches. The metric used to express the temperature standard would also change from an "instantaneous daily maximum" to a "7 day average of the daily maximum" (7-DADMax). For an average water body with continuous temperature monitoring, the 7-DADMax measure is 1 degree lower than the instantaneous daily maximum measure. Diagram 1 shows the differences between the existing rule and the proposed rule. There are no proposed changes for marine waters.

Diagram 1:Summary of Transition to Proposed Temperature Criteria



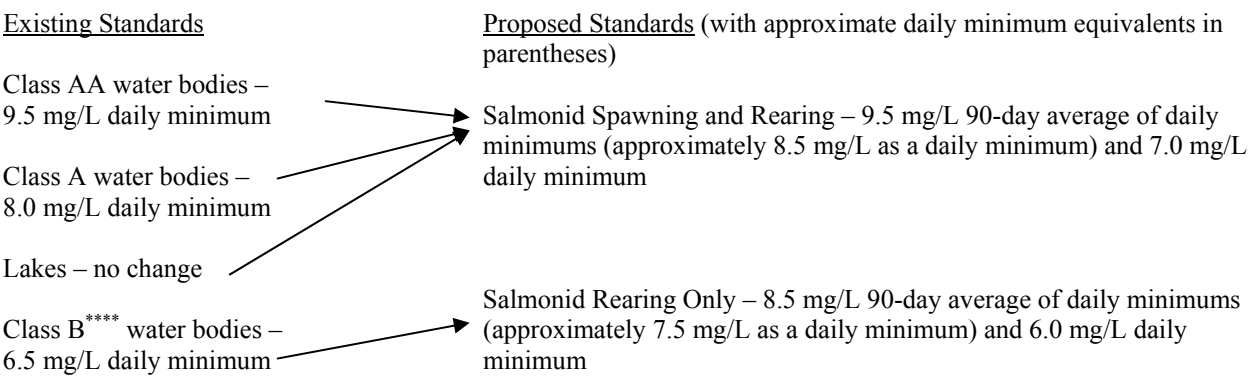
Waterbody reaches, including lakes, which naturally exceed the current standard are already limited to a .3ºC change in temperature. Businesses in naturally limited reaches will be unaffected by the new standards. If the temperature criteria for a water body is increased the businesses will benefit. **Only activities located in specific waterbody reaches will be more constrained. These are reaches where (1) the stream does not naturally exceed the current standard and where (2) the proposed temperature standard is lowered**. This situation forms part of the basis for the worst case analysis.

Heat plumes in mixing zones [173-201A-200 (1)(c)(vi)(C)]: Heat plumes would be required to meet a temperature of 33ºC, 2 seconds after leaving the pipe. This would impact point source dischargers that have high temperature discharges that might exceed this criteria. This situation forms part of the basis for the worst case analysis.

[†††] RCW 19.85.030 (3) lists acceptable forms of cost minimization.
[‡‡‡] There are only 9 class B waterbodies.

Dissolved oxygen standards (DO) [contained in 173-201A-200(1)(d)]: DO standards would be reduced or increased in many fresh water reaches (including lakes). There are no proposed changes for marine waters. DO measurement would change to two metrics: a long-term 90-day average of the daily minimum and a short-term one-day minimum would be used. The daily minimum would be reduced, which should make the standard easier to meet. However, the 90-day average, might be harder to achieve. The DO standard would increase for some waterbody reaches and would be reduced from "allows no change"[§§§] to a numeric standard of 9.5 mg/l for lakes. In some places the DO requirements would increase (See Diagram 2).

Diagram 2: Summary of Transition to Proposed Dissolved Oxygen Criteria



Where the natural level of DO is already lower than the current standard, there will be no change for businesses. This situation forms part of the basis for the worst case analysis.

Table 1

Changes to the Bacterial Standard				
	AA (Primary)	A (Primary)	B (Secondary)	C (Secondary)
Fresh Water				
Primary Contact Use	50 fecal to 100 *E. coli*	100 fecal to 100 *E. coli*	none	none
Secondary Contact Use	none	none	200 fecal to 200 *E. coli*	none
Salt Water				
Shellfish Harvesting Areas	No change regardless of the level of contact use			
Primary Contact Use	14 fecal to 35 enterococci	14 fecal to 35 enterococci	none	none
Secondary Contact Use	none	none	100 fecal to 70 enterococci	200 fecal to 70 enterococci

Bacteriological standards [173-201A-200(2), 173-201A-210(1)(g) and (2)(b)]: The proposed rule uses *E. coli* as the bacterial indicator for fresh water and enterococci as the bacterial indicator for marine water rather than the current fecal coliform test. These changes would increase testing costs for most entities that currently only measure fecal coliform. Where there are shellfish beds in salt water recreation areas there will be no change because the shellfish criteria dominate.

[§§§] The most stringent standard possible.
[****] There are only 9 class B waterbodies.

Agricultural water supplies [173-201A-200(3)(b)]: The proposed rules would set standards to protect the quality of water diverted for agriculture. This would mean additional criteria would be applied to all water bodies where agricultural water supply is a beneficial use. Since use of waters for irrigated agriculture is widespread, the proposed criteria will be broadly applied to rivers, lakes, and reservoirs throughout the state.

SIC†††† Coded Industries Affected

This proposed rule amendment may affect many of the 4 digit SIC coded industries in the state.

Table 2

	Employment Security Data on 4 Digit SIC Coded Industries					
		TOTAL		Permits	Average Employment	
SIC	DESCRIPTION	Companies	Employment	Affected	largest 10%	small
TOTL	INDUSTRY DESCRIPTION					
1031	Copper ores	*	*	1		
2023	Dry, condensed, evaporated product	3	219	1		
2033	Canned fruits and vegetables	42	2904	2	127.3	2.4
2082	Malt beverages	29	943	1	29.6	5.9
2083	Malt	*	*	1		
2086	Bottled and canned soft drinks	11	1138	1		
2092	Fresh or frozen prepared fish	138	6562	4	187.5	12.1
2421	Sawmills and planing mills, general	179	11577	1	148.4	11.1
2611	Pulp mills	7	1331	3		
2621	Paper mills	27	7425	6	435.3	1.5
2679	Converted paper products, nec	8	350	1		2.0
2812	Alkalies and chlorine	6	273	1	25.3	
2819	Industrial inorganic chemicals, nec	13	1088	1	27.3	8.0
2869	Industrial organic chemicals, nec	*	*	1		
2873	Nitrogenous fertilizers	*	*	31		
2874	Nitrogenous fertilizers	*	*	1		
2899	Chemical preparations, nec	13	243	1		2.7
2911	Petroleum refining	26	1833	1		4.9
3241	Cement, hydraulic	5	176	2		
3272	Concrete products, nec	77	1717	1		10.5
3274	Lime	*	*	1		
3313	Electrometallurgical products	*	*	1		
3334	Primary aluminum	11	5060	4	745.2	
3341	Secondary nonferrous metals	4	50	1		
3353	Aluminum sheet, plate, and foil	7	1046	1		
3357	Nonferrous wiredrawing & insulating	*	*	1		
3463	Nonferrous forgings	*	*	1		
3624	Carbon and graphite products	*	*	1		
4226	Special warehousing and storage, ne	40	431	1	29.2	3.5
4789	Transportation services, nec	69	793	1	36.6	4.6
4911	Electric services	193	10671	1	132.1	14.2
4961	Steam and air-conditioning supply	*	*	1		
5171	Petroleum bulk stations & terminals	60	950	4	59.3	11.6

†††† Standard Industrial Classification Codes. This use of SIC code is required by law despite the change of system at the federal level.

1. **Point Sources**: The proposed rule may affect permitted point source facilities in a variety of sectors. These sectors and the number of permits[‡‡‡‡] the facilities hold are listed in Table 2.[§§§§] The impact on permitted activities would depend on:

- Whether the activity is located on a waterbody reach where the water body is not already listed as impaired,
- Whether the incremental change in the standards will require a permit change, and
- The mechanism a permitee chooses to use.

2. Some **POTWs** (Publicly Owned Treatment Works), which discharge to surface water, would be affected by the proposed amendments. If they raise their rates, then many of the businesses discharging to them could be affected at least to a small degree. Most POTWs would be affected by the proposed bacterial changes, but some could also be affected by the proposed changes associated with Agricultural Water Supplies, DO, and Temperature.

3. **Nonpoint Sources** (for more information on how Ecology regulates nonpoint activities go to Appendix C)

a. Business related stormwater may also affect water quality. Ecology's expectation is that the proposed changes to the standard will not require any substantive changes in currently accepted stormwater practices because current practices represent the best available methods for managing urban stormwater.[*****]
b. Forestry activities are covered under the Forest and Fish rules. The changes expected due to the incremental change in the rule are within the error rates for the methods used to determine shade and therefore are not analyzed. (see Appendix C)
c. Agricultural best management practices also affect water quality. These practices are unlikely to shift due to the incremental changes in the standards due to the elevation at which the practices occur. (see Appendix C)

Results of the SBEIS Worst Case Analysis

The set of worst case analyses performed to support this SBEIS (see Appendix B and D) show the following economic effects:

1. **Industrial permits** may be affected. Industrial permits limit the amount and quality of discharge to surface waters by industrial facilities. Each permit is written so that the discharge will not cause a waterbody to exceed the surface water quality standards. Compliance with the permit is mandatory, but the pemitee selects the mechanism to meet the permit requirements. Ecology does not know which mechanisms permitees will choose. However Ecology must still determine whether a disproportionate impact from the proposed rule amendments would occur. So, a worst case analysis was done for a large and a small business.

   This analysis assumed that the permitee chose to stop discharging to surface water and instead used land application during the summer. **Land application was chosen because it**

[‡‡‡‡] Unaffected marine and stormwater permits were not included in the count. Simply being listed here does not mean there is necessarily a cost increase to the facility.
[§§§§] The companies affected may hold more than one permit. The "*" means there are fewer than 3 companies.
[*****] Bill Moore, Environmental Engineer, Water Quality Program, Department of Ecology.

is one of the most expensive possible options, though it is not required by the Water Quality Standards. Costs include probabilistic estimates for testing, land, labor, equipment, engineering assistance, materials, and structures. The largest cost in the short term is the land and irrigation system. The largest cost over the long term is testing of water quality, soil, and crop in order to assure the system is working. **This worst case scenario indicates a disproportionate impact on small businesses with permits.** The cost per employee is four times higher for small business than for large business.

In most places, the proposed changes would have a marginal impact on a permit. For example there is unlikely to be any significant difference for a revised permit that reduces outfall water temperature one degree. The temperature inside a plant may be much higher than the discharge water. A high end discharge may be 30ºC where inside the plant the water may be near boiling. Thus the internal reduction that is already occurring inside a plant is often large by comparison to the additional 1ºC change that would generally be required. Where other less expensive options, which actually cool the water or add DO are taken, the expected cost ranges from 21% to 29% of the worst case cost for small businesses and from 6% to 9% of the worst case costs for large businesses.[†††††]

Permit Worst Case Cost for a 15 year Model: Cost Per Employee for Large and Small Business[‡‡‡‡‡]

	Small Business	Large Business
Cost per employee for land application of wastewater	$40,000	$9,600

Note this is the **present value of 15 years of costs** divided by average employment.
See Appendix B for an explanation of the model basis.
See Appendix D: Monte Carlo Run for the sensitivity test.

2. **Businesses may be affected by changes in POTW rates**. If a given POTW needs to make capital improvements to meet the new standards, it may pass along those costs to its customers (including small businesses) in the form of higher charges. In any SIC coded sector where small and large businesses for some reason have the same billing increase, the rule change will automatically have a disproportionate impact on small businesses. The reader should note that, Ecology considers these cost changes in making decisions regarding such a permit.[§§§§§]

<u>Proposed Cost Minimization</u>

[†††††] Why have some companies (our cases) actually chosen the worst case cost? The reasons seem to have been based on severe stream reach limits and a need for long-term certainty in a setting where permits are evaluated every 5 years.
[‡‡‡‡‡] These values were sensitivity tested with a probabilistic Monte Carlo simulation. The results are in Appendix B and the case descriptions are in appendix D.
[§§§§§] Permit conditions for POTWs may be affected by cost considerations given in 3 chapters in the permit writer's manual: Water Quality Program Permit Writer's Manual 92-109, Chapter 4, Deriving Technology Based Effluent Limits, Chapter 5, Municipal Effluent Limitations and Other Requirements, Chapter 6, Water Quality Based Effluent Limits for Surface Waters.

Ecology must provide cost minimization where it is legal and feasible to do so. Cost minimization applies to both large and small business and falls into several categories.

(a) Reducing, modifying, or eliminating substantive regulatory requirements,
(b) Simplifying, reducing, or eliminating recordkeeping and reporting requirements,
(c) Reducing the frequency of inspections,
(d) Delaying compliance timetables,
(e) Reducing or modifying fine schedules for noncompliance, or
(f) Any other mitigation techniques.

Cost minimization provisions for most record keeping, inspection, compliance time tables, and penalty requirements are regulated by other laws, rules and programs, and are not controlled or dictated by this rule. WAC 173-201A protects water quality through standards, criteria, and the identification of beneficial uses of Washington's waters. However, implementation of WAC 173-201A occurs through other Ecology programs that administer water quality protection through permits, pollution control and reduction programs, and certifications. Therefore, cost minimization provisions below are focused on: reducing, modifying, or eliminating substantive regulatory requirements.

- 173-201A-020: The revised definition of AKART (All Known, Available, and Reasonable methods of prevention, control, and Treatment) has been broadened to include stormwater management manuals.
- 173-201A-200(1)(c) and 200(1)(d): The revised temperature and DO criteria have been designed to avoid unnecessary impact on human economic activities and to allow for reasonable implementation. Revisions include:
  (a) Selecting criteria from the midpoint of the range that bounds the estimate of what maximum temperatures or DO are needed to fully protect species.
  (b) Applying the criteria based on general patterns of stream use and species mixes.
  (c) Not basing recommendations on individual studies showing sensitive outcomes.
  (d) Recognizing longer-term averaging periods where appropriate when developing the recommended criteria.
  (e) Where natural conditions of a waterbody do not meet the criteria, a small allowance for human activities is allowed to be factored in to permits and pollution reduction plans.
  (f) An allowance that criteria can be adjusted to account for the thermal effects of permanent human structural changes.
  (g) Alternative language that allows waterbodies to only have to meet the criteria nine years out of ten. This exemption can be used in situations when temperatures or DO levels are naturally exceeded in extreme climatic years, and will make permitting or modeling more accurate and effective.
- 173-201A-210(2)(b)(2): Alternative bacteria indicator allowance. In situations where enterococci or *E. coli* are not primarily due to warm-blooded animals but instead from, for example, wood waste, the alternative fecal coliform indicator can be used. This prevents the use of enterococci from triggering unnecessary pollution-prevention efforts.
- 173-201A-210(2)(b)(4): Resolving conflicts on shellfish protection. Ecology defers to the Department of Health in determining that shellfish harvest is adequately protected. This prevents unnecessarily strict pollution-prevention measures.
- 173-201A-260: This section contains provisions for applying criteria in general, including:

(a) Allowing the natural condition of a waterbody to be an alternative criteria.
(b) Numeric criteria do not apply to human-created waters for the removal or containment of pollution, such as private farm ponds that did not incorporate natural waterbodies.

- 173-201A-320: The antidegradation section that requires a more detailed analysis from applicants of water quality permits is limited to new and expanded actions that have a measurable change in water quality. This limitation assures that resources are spent on actions that will cause a measurable change, rather than on insignificant actions.
- 173-201A-320(4)(a)(iii): Allows for overrides of anti-degradation standards for innovative pollution controls and management that may advance AKART for a given industry.
- 173-201A-320(4)(b)(ix): Allows for the use of water quality offsets in meeting antidegradation requirements.
- 173-201A-320(6): Allows general permits and pollution control programs to go through an antidegradation analysis at the time the permit is developed and not for each individual action covered by the general permit or pollution control program. This will be a cost savings in terms of not having to provide individual analyses.
- 173-201A-320(6)(c): Allows nonpoint source programs and general permits to use adaptive management, to avoid over-use of control measures and phase in requirements over time.
- Part IV-Tools for Application of Criteria and Uses: This new part in the rule provides several tools for applying alternative criteria or uses. These new tools include provisions for:
  (a) 173-201A-410: The amendment moves the longer duration short term modification of water quality from pesticides to its own subsection that can apply to any short term activity. Thus the flexibility is more broadly provided.
  (b) 173-201A-420: Variances allow criteria to be modified for individual facilities, or stretches of waters on a longer term basis.
  (c) 173-201A-430: Site specific criteria may be developed after determining that the criteria designated for a waterbody cannot be attained due in part or whole to natural climatic or landscape attributes, or irreversible human changes.
  (d) 173-201A-440: A use attainability analysis may be done to remove a designated use for a waterbody that is neither existing nor attainable.
  (e) 173-201A-450: A water quality offset occurs where a project proponent implements or finances the implementation of controls for point or nonpoint sources otherwise under the control of other entities to reduce the levels of pollution for the expressed purpose of creating sufficient assimilative capacity to allow new or expanded discharges. The goal of water quality offsets is to reduce the pollution levels of a waterbody sufficiently enough that a proponent's actions are not causing or further contributing to a violation of the requirements of this chapter and result in a net environmental benefit.
- 173-201A-510(5): Some dams cannot meet water quality standards (e.g. total dissolved gasses, temperature). This allows Ecology to issue a water quality certification for re-licensing of the dam through a compliance schedule, rather than disapproving the certification.
- Lastly, existing programs partially offset some of the impacts on landowners. In the case of agriculture, the Conservation Reserve Enhancement Program (CREP) from the US Department of Agriculture will provide lease payments for some agricultural land set aside into buffers. The Clean Water Act also allows states substantial discretion in applying controls for nonpoint source pollution such that hardship situations can be readily avoided in implementation actions. For more detail on CREP, see Appendix C.

Opportunities for Small Business to Discuss the Proposed Rule with Ecology

Ecology has tried to make businesses an active participant in the development of the proposed revisions to the surface water quality standards. Outreach efforts will continue to include business representation on both technical and policy workgroups, presentations at trade and association meetings, special face-to-face issues with individual business sectors concerned about specific parts of the rule, multiple public hearings, and notification of the proposal and opportunities to participate to a mailing list of over 3,600 interested and affected persons.

As the rule moves toward adoption we will make information and ourselves available to business. Web site for all filing documents and attachments: http://www.ecy.wa.gov/laws-rules/activity/wac173201a.html, Contact for rule content: Susan Braley (360) 407-6414, sbra461@ecy.wa.gov. Contact for economic analysis: Cathy Carruthers (360) 407-6564, caca461@ecy.wa.gov.

Appendix A

Crosswalk Displaying

Current Rule
Proposed Rule
Legal Basis

Crosswalk between 9/97 Current Standards and 12/02 Proposed Standards (WAC 173-201A)

Current Standards 9/97	Proposed Standards 12/02	Federal Requirement	Analysis
173-201A-010 Introduction	173-201A-010 Purpose *Modified*	CFR 131.2	
173-201A-020 Definitions	173-201A-020 Definitions *Modified*	Not required.	*Probable that impact occurs elsewhere in the rule – no analysis*
173-201A-030 General water use and criteria classes	173-201A-200 Fresh water designated uses and criteria 173-201A-210 Marine water designated uses and criteria *Modified*	CFR 131.10-Designated uses CFR 131.11-Criteria	
Fecal coliform for fresh & marine waters: 030(1)(c)(i) (A)(B) 030(2)(c)(i)(A)(B) 030(3)(c)(i)(A)(B) 030(4)(c)(i) 030(5)(c)(i)	Bacteria: Fresh water 200(2)(b) Marine water 210(1)(g) and 210(2)(b) *Modified*	WA's proposal is stricter than 2002 EPA Draft Revision of the Federal Guidance on Bacteria	Analysis indicates cost is smaller than the worst case costs. Proposed criteria is consistent with existing federal guidance and national criteria recommendations for the protection of primary contact recreation. Secondary contact protection was made less stringent then the current state standards.
Dissolved Oxygen-Fresh 030(1)(c)(ii)(A) 030(2)(c)(ii)(A) 030(3)(c)(ii)(A) 030(4)(c)(ii) 030(5)(c)(ii)	Dissolved oxygen Fresh water 200(1)(d) *Modified*	Old guidance, updated by the state using more recent research.	Analysis Done: Proposed criteria is consistent with existing federal guidance on the needs of the species and lifestages existing in Washington State; such factors negate the direct use of the national criteria.
Temperature-Fresh 030(1)(c)(iv) 030(2)(c)(iv) 030(3)(c)(iv) 030(4)(c)(iii) 030(5)(c)(iv)	Temperature Fresh water 200(1)(c) *Modified*	1972 Guidance—outdated and updated by the state using more recent research, Region 10 Guidance drafted but not finalized.	Analysis done
Agriculture water supply 030(1)(b)(i) 030(2)(b)(i) 030(3)(b)(i) 030(5)(b)(i)	Agriculture water supply for fresh water 200(3)(b) *Modified to reference narrative criteria and add new numeric criteria*	1972 Guidance for Irrigation water supply: Elec. Conductivity: *no specific recommendation* Bicarbonate-*no specific recommendation* TSS=*No specific recommendation*	Analysis indicates cost is smaller than the worst case costs. 131.10(a) requires states consider the use and value of agricultural water supplies when setting standards. 131.11(a) requires that states adopt criteria to protect designated uses, such as agricultural water supplies,

			based on sound scientific rationale and must contain sufficient parameters or constituents to protect the use.
Toxic narrative: 030(1)(c)(vii) 030(2)(c)(vii) 030(3)(c)(vii) 030(4)(c)(vi) 030(5)(c)(vii)	Narrative standard for toxic, radioactive & deleterious 260(a) *Same as 9/97*	*No change*	
Aesthetic narrative: 030(1)(c)(viii) 030(2)(c)(viii) 030(3)(c)(viii) 030(4)(c)(vii) 030(5)(c)(viii)	Narrative standard for aesthetic values 260(b) *Same as 9/97*	*No change*	
	Narrative standard for nonpoint source pollution 260(c) *New narrative standard*		
173-201A-030(6) Establishing lake nutrient criteria.	173-201A-230 Establishing lake nutrient criteria *Same as 9/97*	*No Change*	
173-201A-040 Toxic substances	173-201A-240 Toxic substances *Modified for Ammonia and minor clarification edits for other toxic criteria*	CFR 131.36-Toxics Criteria for those states not complying with CWA section 303(c)(2)(b).	
040(3)-Table of Toxic criteria	Table 240(3)(f) & (g) Ammonia equations *Modified*	*Partial change based on updated EPA guidance. Does not use the EPA recommended chronic values in salmonid waters due to concerns over conflicts in cited studies. Result is that the current EPA approved state criteria for chronic protection remains in place in salmonid waters.*	EPA cost imposed is exempt.
173-201A-050 Radioactive substances	173-201A-250 Radioactive substances *Same as 9/97*	*No change*	
173-201A-060 General considerations	173-201A-260 Application of water quality criteria *See below*	*No substantive changes in this section—all parts moved to other sections*	
060(1)	260(3)(d)	*No change*	
060(2)	260(e)(i)-(ii)	*No change*	
060(3)	200(2)(b)(i)	*No change*	
060(4)(a)-(b)	200(1)(f)(i)-(iv)	*No substantive change*	
060(5)	510(1)(a)-(b)	*No substantive change*	
060(6)	510(1)	*No substnative change*	

060(7)	260(3)(g)	*No substantive change*	
060(8)	260(3)(h)	*No substantive change*	
060(9)	200(1)(c)(vii)	*No change*	
060(10)(a)-(c)	260(3)(i)(i)-(iii)	*No change*	
070(2)	260(2) Natural and irreversible conditions *Modified*	*Statement on natural conditions broadened to include human structural changes as determined consistent with 40 CFR 131.10(g)(3)&(4)*	*Cost reducing*
	260(3)(f) Human created waters	*New subsection for exempting human-created waters managed primarily for the removal or containment of pollution. Not federal requirement.*	*Cost reducing*
173-201A-070 Antidegradation	173-201A-300 Purpose of antidegradation 173-201A-310 Protection of existing uses 173-201A-320 Protection of waters with better water quality than the standards *Modified*	CFR 131.12-Antidegradation	*Cost reducing features*
173-201A-080 Outstanding resource waters	173-201A-330 Protection of Outstanding National Resource Waters *Modified*	CFR 131.12-Antidegradation Protection only occurs after future rulemakings naming affected waterbodies.	*Cost reducing*
173-201A-100 Mixing zones	173-201A-400 Mixing zones *Same as 9/97*	*No change.*	*Analysis through temperature change for any mixing zone impacts.*
173-201A-110 Short-term modifications	173-201A-410 Short-term modifications *Modified*	*Eliminated requirement to keep modifications only to 1-year unless a long-term management plan is in place.*	*Cost reducing*
	173-201A-420 Variances *New Section*	Must comply with CFR 131.10(g)	
	173-201A-430 Site specific criteria *New Section*	Must comply with CFR 131.10	
	173-201A-440 Use attainability analysis *New Section*	Must comply with CFR 131.10	
	173-201A-450 Water quality offsets *New Section*	*No federal requirement*	*Cost reducing*
173-201A-120 General classifications	*Incorporated into 173-201A-602 and 612*	*No substantive change.*	
173-201A-130	173-201A-600 Table 602	131.10(a) requires states	

Specific classifications -- Freshwater	Most stringent use designations for fresh waters by Water Resource Inventory Area (WRIA) *Modified*	specify appropriate uses that must be achieved and protected. 131.11(a) requires that states adopt criteria to protect designated uses based on sound scientific rationale and must contain sufficient parameters or constituents to protect the use.	
173-201A-140 Specific classifications -- Marine water	173-201A-610 Table 612 Most stringent use designations for marine waters *Modified*	131.10 requires states specify appropriate uses that must be achieved and protected. 131.11(a) requires that states adopt criteria to protect designated uses based on sound scientific rationale and must contain sufficient parameters or constituents to protect the use.	
173-201A-150 Achievement considerations	173-201A-500 Achievement considerations *Same as 9/97*	*No change*	
173-201A-160 Implementation	173-201A-510 Means of implementation *Modified*	*No substantive change*	
	510(5) Compliance schedules for dams *New subsection to address dams*	*New subsection. No federal requirement.*	*Cost reducing: Current standards do not allow compliance schedules for 401 certifications of dams. Remainder of section clarifies need to remain consistent with 131.10 on use protection.*
173-201A-170 Surveillance	173-201A-520 Monitoring and compliance *Same as 9/97*	*No change*	
173-201A-180 Enforcement	173-201A-530 Enforcement *Same as 9/97*	*No change*	

Appendix B

Permit Case Basis

For

Worst Case Analysis

Permit Facility Case Basis

Summary Statement

The purpose of this appendix is to provide background documentation on the business cases which were reviewed for the Small Business Economic Impact Statement (SBEIS). This appendix shows why a worst case analysis determined that there is a disproportionate impact[A] from the proposed rule.

The possibility of a disproportionate impact must be evaluated based on the 4 digit SIC codes affected. Some industrial permits may be affected by the proposed rule. Industrial permits limit the discharge of a wide range of substances and impacts. A small number of facilities within each 4 digit Standard Industrial Classification Code have permits and a few of these permits may be affected. These permit limits may be affected by the proposed changes discussed in the SBEIS especially Temperature, Dissolved Oxygen (DO), Bacteria, and Agricultural Irrigation Water Standards.

Table 1

Employment Security Data on 4 Digit SIC Coded Industries						
		TOTAL		Fresh Water	Average Employment	
SIC	DESCRIPTION	Companies	Employment	Permits	largest 10%	small
TOTL	INDUSTRY DESCRIPTION					
1031	Copper ores	*	*	1		
2023	Dry, condensed, evaporated product	3	219	1		
2033	Canned fruits and vegetables	42	2904	2	127.3	2.4
2082	Malt beverages	29	943	1	29.6	5.9
2083	Malt	*	*	1		
2086	Bottled and canned soft drinks	11	1138	1		
2092	Fresh or frozen prepared fish	138	6562	4	187.5	12.1
2421	Sawmills and planing mills, general	179	11577	1	148.4	11.1
2611	Pulp mills	7	1331	3		
2621	Paper mills	27	7425	6	435.3	1.5
2679	Converted paper products, nec	8	350	1		2.0
2812	Alkalies and chlorine	6	273	1	25.3	
2819	Industrial inorganic chemicals, nec	13	1088	1	27.3	8.0
2869	Industrial organic chemicals, nec	*	*	1		
2873	Nitrogenous fertilizers	*	*	31		
2874	Nitrogenous fertilizers	*	*	1		
2899	Chemical preparations, nec	13	243	1		2.7
2911	Petroleum refining	26	1833	1		4.9
3241	Cement, hydraulic	5	176	2		
3272	Concrete products, nec	77	1717	1		10.5
3274	Lime	*	*	1		
3313	Electrometallurgical products	*	*	1		
3334	Primary aluminum	11	5060	4	745.2	
3341	Secondary nonferrous metals	4	50	1		
3353	Aluminum sheet, plate, and foil	7	1046	1		
3357	Nonferrous wiredrawing & insulating	*	*	1		
3463	Nonferrous forgings	*	*	1		
3624	Carbon and graphite products	*	*	1		
4226	Special warehousing and storage, ne	40	431	1	29.2	3.5
4789	Transportation services, nec	69	793	1	36.6	4.6
4911	Electric services	193	10671	1	132.1	14.2
4961	Steam and air-conditioning supply	*	*	1		
5171	Petroleum bulk stations & terminals	60	950	4	59.3	11.6

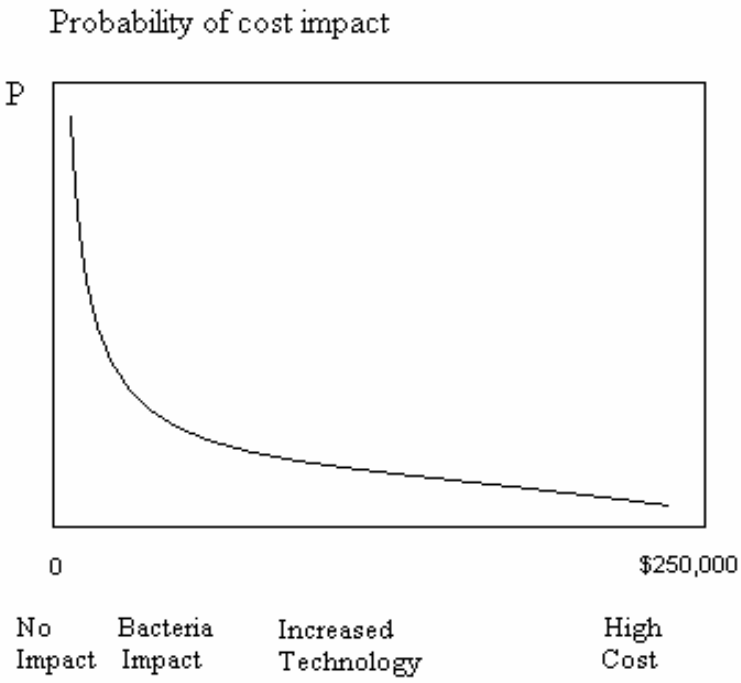
Business Impacts: range from cost reduction to cost increases

In most places, the proposed amendment will have a marginal impact on a business with a permit. In some areas the standards will be less stringent, in some areas there will be no change, and in some areas the standards will be more stringent.

- In areas where the rule is less stringent, the costs may or may not be reduced, depending on the permit.
- Large areas of the state will not experience any impact, depending on the pollutant. This is more likely for lakes, discharges to marine waters, discharges to the Columbia, discharges to areas where an increased mixing zone will suffice, or situations covered by AKART.
- Areas, where the rule is more stringent, are the target of the evaluation.

For permitees, within areas for which some part of the rule is more stringent, there may or may not be costs. Some permitees, who do fecal coliform testing, will have about a 30% increase in testing costs. Some may have tighter temperature or DO limits. However, in practical terms, in most places, the proposed amendment will have a marginal impact on a permit. For example there is unlikely to be any significant difference for a permit that reduces outfall water temperature one degree. The same can be said of each of the other tighter constraints on releases to surface waters, including DO. There are many mechanisms to reduce temperature or increase DO. For example, holding water in a pond and spraying it into the air at night for morning release will do both.

Figure 1: Cost impacts based on parts of the rule



The cost of *E. coli* or enterococci tests or both of them will increase costs for some dischargers. For water treatment plants and Publicly Owned Treatment Works, there will be about a 30% increase in testing costs, which may be passed on to businesses through the utility bills.

Some areas of the state may be affected by higher costs. These areas will be on stream reaches where (1) proposed changes to temperature or DO standards reduce the temperature or increase DO, (2) which are not already subject to natural condition limits under the current standard and (3) where added mixing zones or further dilution is not possible.

Thus, for any given business there is a high probability of experiencing no costs or very low costs. For some businesses there may be costs if they need to increase their mixing zone or increase the dilution rate. Some businesses may add technological improvements to their waste water systems. Finally, for some businesses which pull out of the surface water system, costs may be high.

Uncertainty regarding impacts

The difference in areas and the differences in the entities, for which the rule creates costs, create a high variance in costs. In order to estimate whether there is a disproportionate impact Ecology will use the high cost end of the continuum of costs. This will provide a conservative estimate of the disproportionate impact, in that it is biased against the rule. The quantified part of the SBEIS will therefore deal with areas of the state where the proposed temperature standard decreases and the proposed DO standard increases.

It is difficult to know whether any given permitee will be affected.

- Each permitee has different pollutants.
- No permits will be further constrained in stream reaches that don't currently meet the standards.
- For an impaired waterbody, a Total Maximum Daily Load must be defined for each pollutant that exceeds the criteria to determine the waste load allocations for each permit.
- Permitees propose their discharge to surface water after selecting from a variety of treatment options. Compliance with the standard is mandatory but the permitee selects the mechanism that their plant proposes to use to meet the standard. An engineering analysis generally accompanies the proposal. Ecology does not know ahead of time which mechanisms the permitees will choose to meet the standard.

Selecting a Worst Case

Given the uncertainties Ecology cannot estimate the average impact of the rule. However, Ecology must determine whether a disproportionate impact from the proposed rule amendments would occur. Given the unknowns, Ecology has two options:

- If Ecology selects an expected choice that is less expensive than the worst case option then Ecology may generate a more "typical" model, but might be implicitly biasing the analysis for a business somewhere in the state.
- A worst case analysis, however, biases the analysis against the rule and presents high costs that are much less likely to actually occur in an individual case.

Ecology evaluated several options, low cost and worst case, and decided to focus on the worst case, even though it will present costs that are less likely to occur. This was done in order to prevent any possibility of underestimating the impact and/or making a determination regarding disproportionate impacts on that basis.

A worst case analysis was modeled for a large and a small permitee based on two cases of permitees, who have decided not to discharge to surface water during the summer

because of the DO limits or the temperature of their water. If either of these two problems have an impact on a permit, the cost would be higher than the bacterial or agricultural criteria.††††††

Land application was chosen as the worst case analysis because it is the most expensive option. It is unusual for a permitee to select this option. However, a few have done it and the dairies use this option.

- Land application is one of the most expensive options because it generally requires purchasing land and equipment and paying for tests. In the case of some contaminants, it may require harvesting a crop that removes the contaminant and sending it directly to the landfill. Thus, a shift to land application with no offsetting income gain from a crop was selected because it was a worst case scenario.

Lower cost evaluations, which were not selected:

Ecology did an approximate evaluation of parts of the rule to decide which part to select for the worst case option.

Ecology evaluated the bacteria testing changes as a driver for the worst case analysis. The *E. coli* and Enterococci tests will be more expensive than the fecal coliform testing in the current rule. This is especially true for permits in fresh water that moves quickly into saltwater. There, more than one test may be required. However, the cost increase for these tests will range from $0 to $9 per test depending on the tests. Even with daily testing these costs will be in the hundreds, where a worst case cost of spreading water on land for treatment, will cost in the thousands. Therefore these cost drivers were rejected for worst case analysis.

Table 1: Micro Biology Test Costs

Bacterial Test	Price
E. coli membrane filter	$30
Fecal Coliform membrane filter	$20
Fecal Coliform most probable number	$39
Fecal Coliform and E. coli most probable number	$44
Total Coliform membrane filter	$25
Total Coliform most probable number	$39
Enterococci membrane filter	$29
Enterococci most probable number	$39

Ecology also evaluated total suspended solids as a component of the Agricultural Waters Standard as a driver for the worst case analysis. A settling pond will allow solids to settle out. Depending on the size of the discharge and the cost of land, a very simple settling pond is relatively inexpensive at a cost as low as about $.25 per gallon of capacity. Therefore this cost driver was rejected for the worst case analysis.

Temperature and Dissolve Oxygen have the potential to be more expensive

The limiting factor for any permit will tend to impose the greatest costs. DO has been a driver for a couple of permitees to move their discharges out of surface water. This is an expensive option but economic logic dictates that the companies did this because they viewed it as more advantageous than other options which, on their face, look less expensive. Most permits do not have a temperature limit. Temperature limits would be handled by some of the same options as DO, therefore, for a worst case analysis these could be taken together.

There are multiple technologies to handle DO and Temperature, but even the low cost technologies would probably be more expensive than the proposed changes in bacteria and agricultural standards. Text Box 1 indicates some options that permitees have, which were estimated on a preliminary basis and rejected because they were lower cost estimates.

Text Box 1:

LOWER COST, INCREASED TECHNOLOGY SCENARIOS:

Two additional heat limited facilities were evaluated in addition to the worst case analysis. These facilities have existing temperature limited permits. After discussion with the engineer, the permitees would have several options to deal with a change in the temperature standard.

1. They could purchase a water right and use additional through-put to reduce the temperature at the outfall (at 29% of worst case cost for small company and 9.2% of worst case cost for the large company).
2. They could construct a pond and store water during the high temperature parts of the day and allow it to cool for early morning release (21% of worst case cost for small company and 6% of worst case cost for the large company).
3. They could create a structure that would allow the water to fall through the air and therefore reduce the temperature at the outfall (at 23% of worst case cost for small company and 6% of worst case cost for the large company).
4. They could add refrigeration (not estimated, uncertain and possibly based on purchased patented technology).
5. They could reduce their product output so that the cooling water would not be heated to the temperatures it currently reaches (not estimated, very high variance cost option, possibly low cost if demand is falling, possibly valued at share of total plant.).

Note: These facilities were substantially larger than the worst case facilities and the size adjustment was purely hypothetical, so it would be dangerous to assert the comparison of these cost reductions would hold. Further, Ecology did not have information on engineering costs for these options because there was no engineering in the permits, just the outfall limit and monitoring requirements.

Worst Case Analysis

Quantified Cost Impacts for the Worst Case Analysis

NPDES Permit Shift Away from Surface Water: A Worst Case Basis for Permitees

Ecology analyzed two permits for using irrigated crop land to dispose of waste water that could not be discharged to a stream during the summer months. Each permitee can decide which proposal to submit to Ecology. In this case the large permitee could actually have used a less expensive option and discharged to surface water in a different place, but opted to use irrigated crop land.

Table 2

Comparison of Worst Case Cost Impacts for Small and Large Permits		
	Company Type	
	Large	Small
Land Requirements	$ 585,000	$ 56,160
Site Analysis Requirements	$ 6,250	$ 5,000
Equipment Requirements	$ 758,748	$ 139,486
Labor Requirements	$ 47,955	$ 35,413
Monitoring Costs	$ 747,835	$ 212,648
Total 15 year PV	$ 2,145,788	$ 448,707
Average Number of Employees	222.4	11.2
15 Year Present Value Cost per Employee	$ 9,648	$ 40,063
Ratio		4.2

Both the small and the large business worst cases involve: purchase of land, moving of water to the land, containment systems for water during periods when the water can not be sprayed on the land, irrigation systems, monitoring of water and soil quality, monitoring wells, and ongoing labor, energy, and maintenance costs. Some cases truck water to the land, while others use a piping system. The largest costs were for monitoring, land, and equipment. Some cases use irrigation all year around, using storage when they have too much water or when fields are frozen. Other cases use this system only during the low flow period of the year. The modeled cost impact is disproportionate. The 15 year cost of the decision is $40,000 per employee for the small business and $9,600 per employee for the large business.

Given that Ecology only had two cases, it was unclear whether the data was sensitive to the case situation itself. Therefore, a Monte Carlo was used for probabilistic sensitivity testing of this model. These cases were based on permitees drawn from the same SIC code but were adjusted for the Monte Carlo to allow for a range of costs. For example, the amount of land, the depth of monitoring wells, the number of lab samples, the number of fields, the length of piping, the size of the containment systems and the ongoing costs were allowed to vary. The distribution of each item was set to create the range in which the item might vary. Table 2 provides the summary data which generates the Monte Carlo, a probabilistic method for sensitivity testing the analysis. [The raw data that feeds into Table 2 is provided in Tables 3 and 4 at the end of this document.] Figure 2 illustrates an assigned distribution for the size of field needed to handle the discharge

Worst Case Analysis

What is a Monte Carlo?

A Monte Carlo is a simple technique that allows repeated trials to make a forecast that shows the range of possible outcomes. The Monte Carlo allows the user to assign distributions to the numbers that drive a result so that they can vary at random within the distribution. The result then varies based on the changing numbers and a distribution of results is formed.

Example
Land Price per Acre → varies
x Acres → varies
Cost of Land → → → → Create a distribution

If the land price and the number of acres is allowed to change and we perform the multiplication 1,000 times, then we will have a distribution for the Cost of Land.

water. It is this kind of distribution, assigned to each major cost component, which allows Ecology to test for a range of possible cost per employee outcomes for small and large businesses. The Monte Carlo run is in appendix D. Each of the distributions chosen as inputs to the Monte Carlo are displayed.

Figure 2: Example of an input distribution, the range of acreage needed for the small business case.

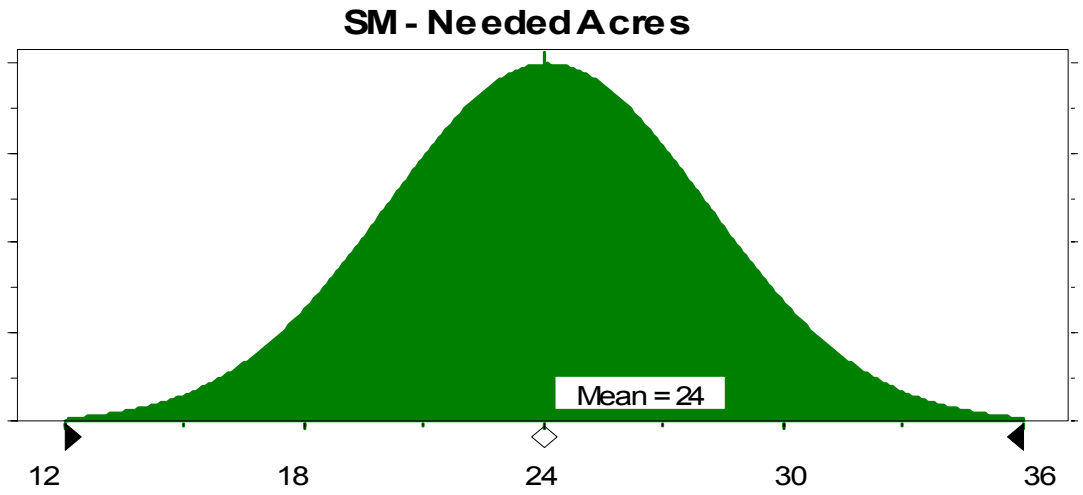
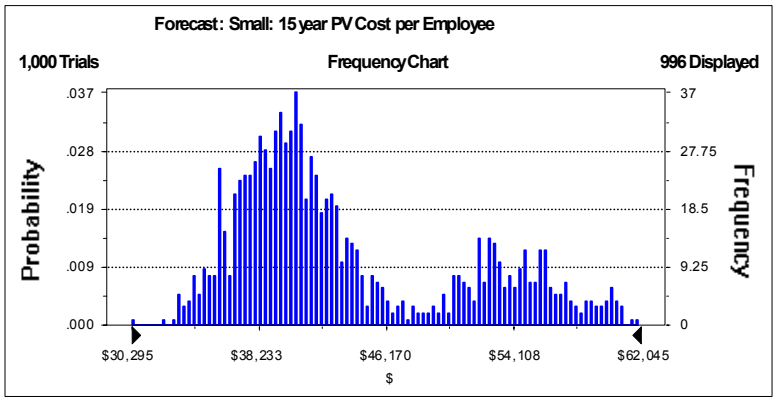


Figure 3: Small Business, 15 year present value of total costs

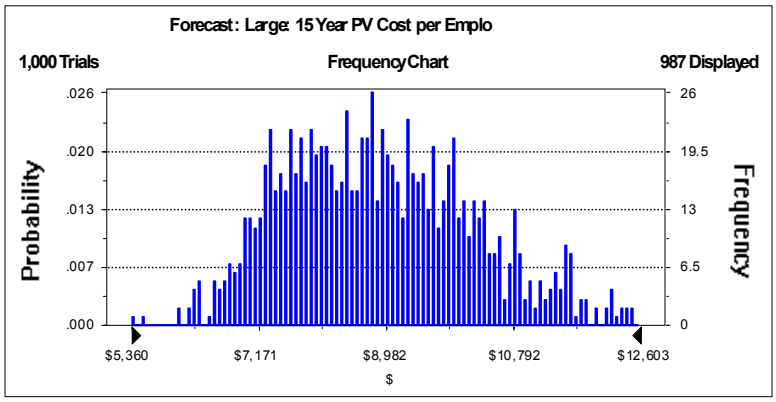


The range of small business costs, illustrated in Figure 3, were estimated to range from $30,000 to over $62,000 per employee for a **15 year present value of total costs**. Note that the distribution is bimodal. This is driven by the fact that some permitees would have to sample more often than others.

Frequency of sampling depends on the pollutant and the nature of the waste water application. The median cost per employee was $41,000. The average 15 year cost for the worst case scenario was $44,000 per employee. These costs are an order of magnitude higher than the lower cost scenarios.

Worst Case Analysis

Figure 4: Large Business, 15 year present value of total costs



The worst case median 15 year present value of cost per employee is $8,800. The range of large business costs, in figure 5, had a much larger range of 15 year present value of cost per employee. It moved from $5,000 to $14,000. Note that the high end of this range is below the low end of the small business range. **The impact is disproportionate for the entire range of the worst case.**

Low cost options and disproportionate impact

If business uses lower cost options, would it make a difference?

Low Cost Scenario:

Small Business-

The 15 year present value of cost for this small business case ranged in cost from $4300 to $5900 per employee.

Low Cost Scenario:

Large Business –

The 15 year present value of cost for this large business case ranged in cost from $1300 to $1900 per employee.

Ecology expects that businesses will choose the most cost effective way to meet the standard. The costs for small business may be an order of magnitude lower than those modeled for the worst case analysis. The costs for large business may be 80% lower than the worst case analysis would indicate. However, there are still economies of scale in each of the low cost options available to the businesses. Thus the smaller cost options would also produce a disproportionate impact.

Table 3: Small Case Data - with special case identifiers suppressed:

Small Case		Total Cost	Average Employment		Cost per Employee			Annualized
		$ 448,707	11.2		$ 40,063			$ 3,258
Land Requirements								
63	Actual Acres							
24	Needed Acres	$ 56,160	price		2340			$ 56,160
	Limits				Wells			
35	B1	150	field		3			
28	B2	150	field					
47	1	75	field		3			
Site Analysis Requirements		minimum	$5,000					$ 5,000
1000	Irrigation system cost /acre							
100	gal							
0.06	p/gal							
6	Wells							
77	Average depth							
30	$/ft							
Equipment Requirements								
$ 24,000	Irrigation System							$ 41,280
$ 17,280	Lagoon	Cost estimate						
$ 13,860	wells							$ 13,860
60000								$ 84,346.22
	15							
1980	5							
	1.45		0.29					
	0.81							
Labor Requirements								$ 35,412.69
	2	hrs/d	1.6					
	12	Wage & ben						
2880	labor							
Monitoring Costs					**15 year**	**Present Value**		$ 212,648

Note: Green cells vary to drive the Monte Carlo.

Table 4: Large Case Data - with special case identifiers suppressed

Large Case	Total Cost	Average Employment		Average Cost per Employee			Annualized	
	$ 2,145,788	222		$ 9,648			$ 785	
Land								
250	Acres	$ 585,000	price	2340				$ 585,000
1000	Irrigation system cost /acre							$ 250,000
$ 25.00	**Site Analysis**	$ 6,250						$ 6,250
Installation and running costs for facility								$508,748.15
200000	Gal/day	54750000						
8333	Gal/hr							
139	Gal/min							
40								
2		longest						
$ 2,203.09		+ backup		$ 4,406				
$ 7,500.00		50	ft	$ 7,500				
		150	p/ft					
10499	lf pipe installed			$ 157,480				
$ 15	$/lf							
$ 45,002	Build housings	45000		$ 45,002				
$ 20,001	Electrical			$ 20,001				
$ 1,392	flow meter			$ 1,392				
$ 110	temp			$ 110				
$ 180,000	lagoon	100	gal	$ 180,000				
		0.06	p/gal					
$ 18,001	Aerator	18000						
$ 6,023	Electrical	p/kwh	0.05	$ 74,056				
		kwh/d	330					
18801		9.00	Wells	$ 18,801				
		77.37	Average depth					
		27	$/ft					
SUM				$ 508,748				
Labor								
3900	labor	hrs/d	2					$ 47,955
		Wage & ben	15					
Monitoring Costs								$ 747,835

Note: Green cells vary to drive the Monte Carlo.

Appendix C

Minimal Impacts from Proposed Rule Changes
For
Nonpoint Sources

December 19, 2002

TO: File

FROM: Dave Peeler

SUBJECT: The effect of changes to the state water quality standards on agricultural practices for the purposes of the Small Business Economic Impact Statement

Minimal effect

One of the purposes of the Clean Water Act is to protect beneficial uses, which include those (among others) aquatic species that depend on clean, cold water for survival.

The proposed changes for temperature criteria will change the water quality standards in a variety of ways. The criteria to protect bull trout will change to 13ºC. The char default generally applies above 700' (West side) and 2000' (East side). The vast majority of char streams are in forested areas, and only a small percentage are in agricultural land about 0.4% according to analysis. The waters that are primarily in the forest environment and forest practices activities on such lands are covered under the Forest and Fish rules for private and state forest lands.

The criteria for the protection of salmon spawning and rearing in the proposed rule is changed to 16 ºC 7-DADMax (equivalent to about 17ºC daily maximum).

- This translates to approximately one degree more stringent for water bodies that are regulated under the current Class A 18 ºC daily maximum.
- It is about 1 degree less stringent for water bodies currently regulated under the current Class AA 16 ºC daily maximum.

The Forest Practices shade manual was used to determine the additional percent shade that would be needed to meet the 1ºC degree increase for class A streams. In eastern Washington, the average elevation of agricultural land is less than 1800 feet. This is based on an evaluation of the elevation bands contained in a GIS elevation data layer (analysis attached). In the eastern Washington shade curves for forest practices, any stream at an elevation of less than 2100 feet needs 100 percent shade in order to protect beneficial uses sensitive to temperature under the new standard of (16ºC -7DADMax) 17 ºC instantaneous. The current standards would require 100% shade on streams below 1800 feet for class A streams. Since the average elevation of agricultural activities in eastern Washington is less than 1800 feet there would be no significant difference in the shade required for salmonid streams in eastern Washington.

Elevation requiring 100% Shade	Temperature to be met
2,400 feet	16 ºC daily maximum.
2,100 feet	17ºC daily maximum (equivalent to 16ºC -7DADMax)
1,800 feet	18ºC daily maximum.

For western Washington, the median elevation for agricultural land is approximately 150 feet. Using the Forest Practices shade curves for western Washington, there is an approximate change

of 6 to 8 percent more shade needed on class A streams and 6 to 8 percent less shade needed on class AA streams. This small change probably is within the error rate contained in collecting shade data using a hand densitometer (Water Quality Monitoring Guide Book, pages 14-17 to 14-18). Determining what 6-8% would mean in terms of more shade is impractical. That coupled with the error rate for determining shade lead Ecology to believe that the increased shade that may be needed to keep water cool in agricultural areas in western Washington is also negligible.

Mitigating measures:

- **Conservation Reserve Enhancement Program (CREP)**

  USDA Farm Service Agency (FSA), Commodity Credit Corporation (CCC), and the State of Washington have agreed to implement a voluntary Conservation Reserve Enhancement Program (CREP) to improve the water quality of streams providing habitat for salmon species listed under the Federal Endangered Species Act. The project area includes all streams in Washington crossing agricultural lands providing spawning habitat for the endangered salmon species.

  The Washington State Enhancement Program is authorized to enroll up to 100,000 acres to be devoted to riparian buffers planted to trees. CCC will pay applicable land rental costs, 50 percent of the cost of establishing conservation practices, an annual maintenance incentive, and a portion of the costs of providing technical assistance. The State of Washington will pay 37.5 percent of the cost of establishing conservation practices, all the costs of the annual monitoring program, and a portion of the technical assistance costs.

  Annual rental payments will be based on the soil rental rate, as calculated by FSA. For installing the riparian buffer, producers will receive each year an incentive payment 50 percent above the annual per acre rental rate. Additionally, producers will receive a 10-percent incentive payment for lands protected as agricultural lands under the Washington Growth Management Act.

- **Environmental Quality Incentives Program (EQIP)**

  The Environmental Quality Incentives Program provides technical, educational, and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to farmers and ranchers in complying with Federal, State, and tribal environmental laws, and encourages environmental enhancement. The program is funded through the Commodity Credit Corporation. The purposes of the program are achieved through the implementation of a conservation plan which includes structural, vegetative, and land management practices on eligible land. Five- to ten-year contracts are made with eligible producers. Cost-share payments may be made to implement one or more eligible structural or vegetative practices, such as animal waste management facilities, terraces, filter strips, tree planting, and permanent wildlife

habitat. Incentive payments can be made to implement one or more land management practices, such as nutrient management, pest management, and grazing land management.

The major focus of EQIP in Washington has been to address surface water quality concerns, threatened and endangered species, soil erosion, and water quantity. Significant financial assistance has been used for installing animal waste systems, irrigation conversion to more efficient systems, nutrient management, pest management and conservation tillage systems.

Approximately 1600 bids requesting $40 million dollars have been made.

Washington State has approximately 800 contracts obligating $16.8 million dollars of cost share to implement conservation practices.

- **Regulating the Effect of Farms on Water Quality**

Ecology has significant discretion to tailor nonpoint sources control efforts to avoid over-regulation. In some areas only narrow filter strips of perennial grass may be needed to protect aquatic systems, in others only a narrow stand of healthy trees will accomplish the needed protection, while still in others the nature of the farm runoff combined with the type of affected stream may demand that both a filter strip and a treed buffer be provided.

The regulatory requirements for nonpoint sources are often misunderstood. The federal Clean Water Act and the State Water Quality Act both provide high goals and expectations for all sources of pollution, but both also grant the state considerable flexibility in how it manages nonpoint source control programs. The state can use educational programs, cost-assistance programs, or punitive regulatory programs in almost any combination. The state's aim is to slowly develop programs using adaptive management to determine the most cost effective combinations of best management practices and best balance of educational and incentive-based programs. Adaptive management is the practice of deliberately testing out management practices in defined sets or one at a time to evaluate their relative cost-effectiveness. It has the intended purpose of preventing more practices from being recommended or required than we are sure are necessary to protect water quality. The discretion provided under the Act's also allows Ecology to ensure that the circumstances of individual farms are taken into account when recommending or requiring best management practices.

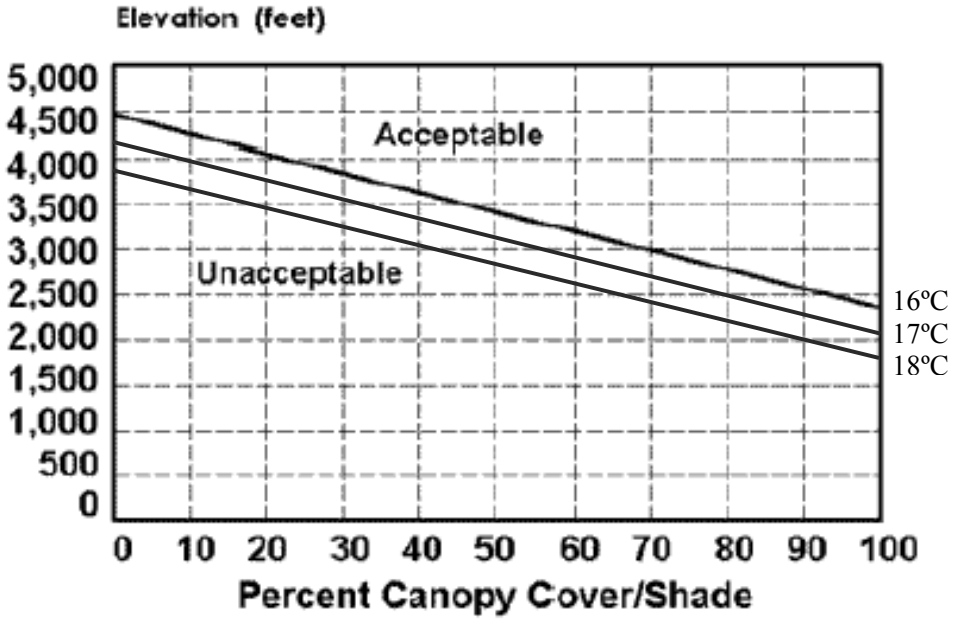
While enforcement actions do sometimes occur, Ecology, views these measures as an unwelcome course of action. Although it is often the measure of focus in the media, agricultural enforcement is reserved for individuals that are causing clear harm to water quality but who are unwilling to respond to reasonable schedules for improving conditions. Ecology, through a cooperative agreement, lets local conservation district staff work one-on-one with farms that are causing significant problems. District staff help the farmer develop farm plans that are designed for the particular situation. Two years, or more depending upon the situation, is provided for cooperating farms to move into full compliance with the farm plans prior to Ecology coming back into the picture and considering the need for enforcement action. Apart from situations where the

department is trying to alleviate significant sources of water quality degradation, the tools that Ecology rely on are those that promote voluntary change: education, technical assistance, and financial support

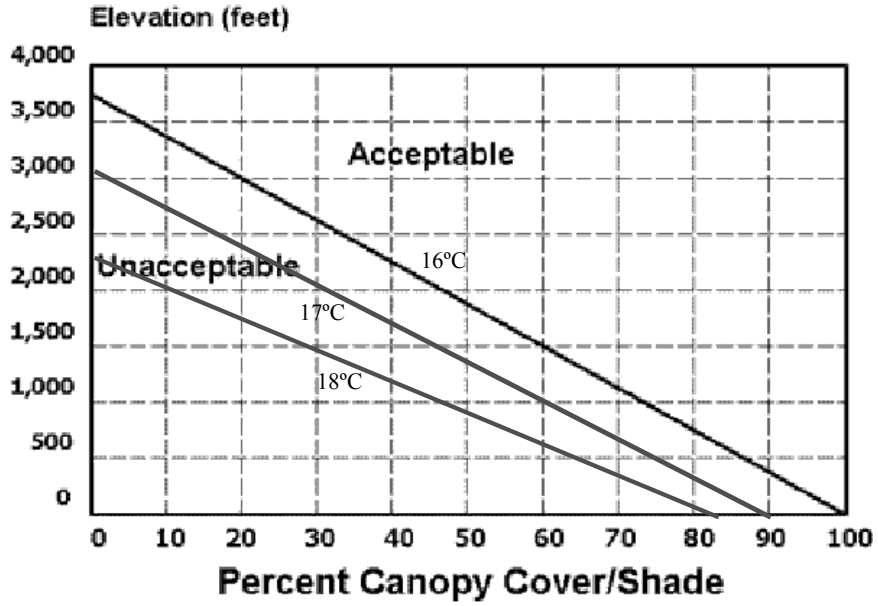
Conclusion:

No economic analysis of agricultural practices is included in this SBEIS because Ecology expects that the effect of the standards on change on agricultural lands will be minimal and there are mechanisms in place to mitigate costs to landowners.

Eastern Washington Canopy Cover Required
16 degrees C



Western Washington Canopy Cover Required
16 degrees C

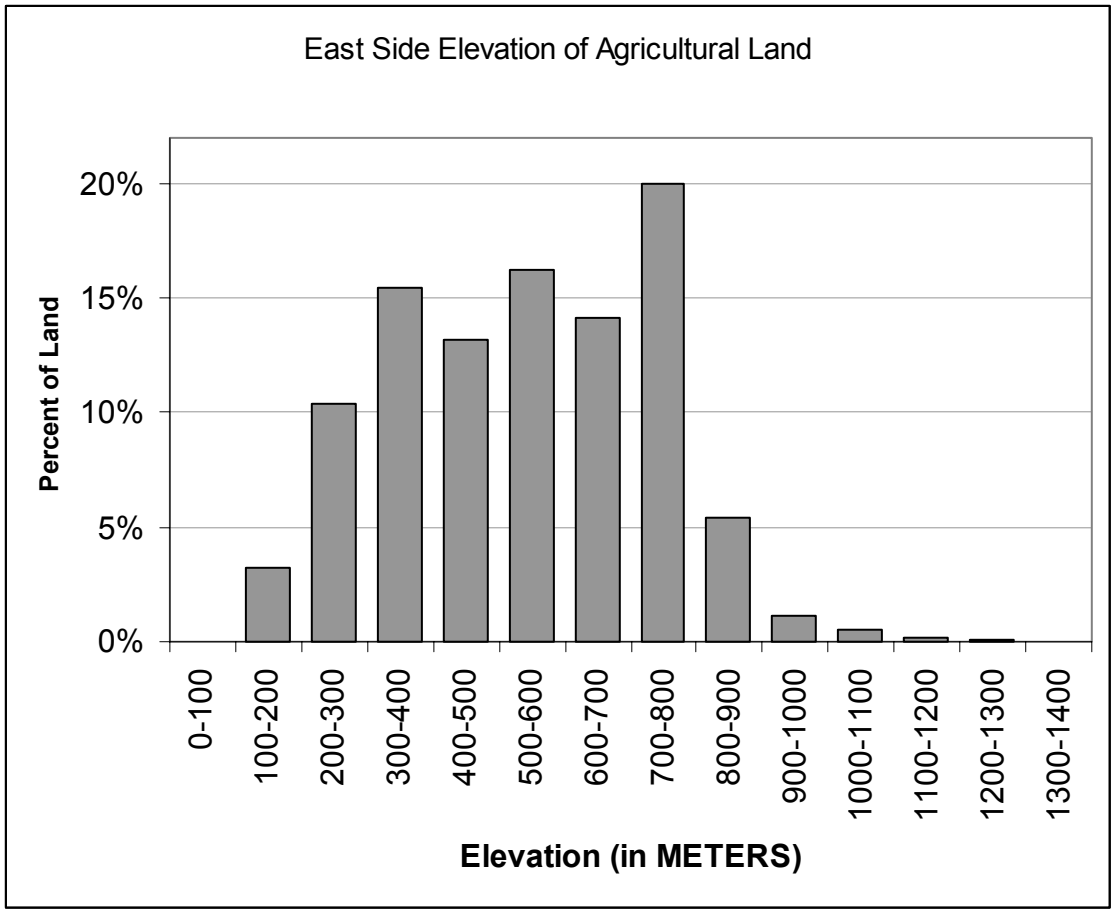


Elevation of Agricultural Land in Washington

NOTE: ***All Elevations are in Meters!*** *(A conversion chart is attached)*
"Count" is the number of cells on the map, which is simply a measure of land area.

Summary of Results – East Side Data

Average East Side Elevation: 541 Meters

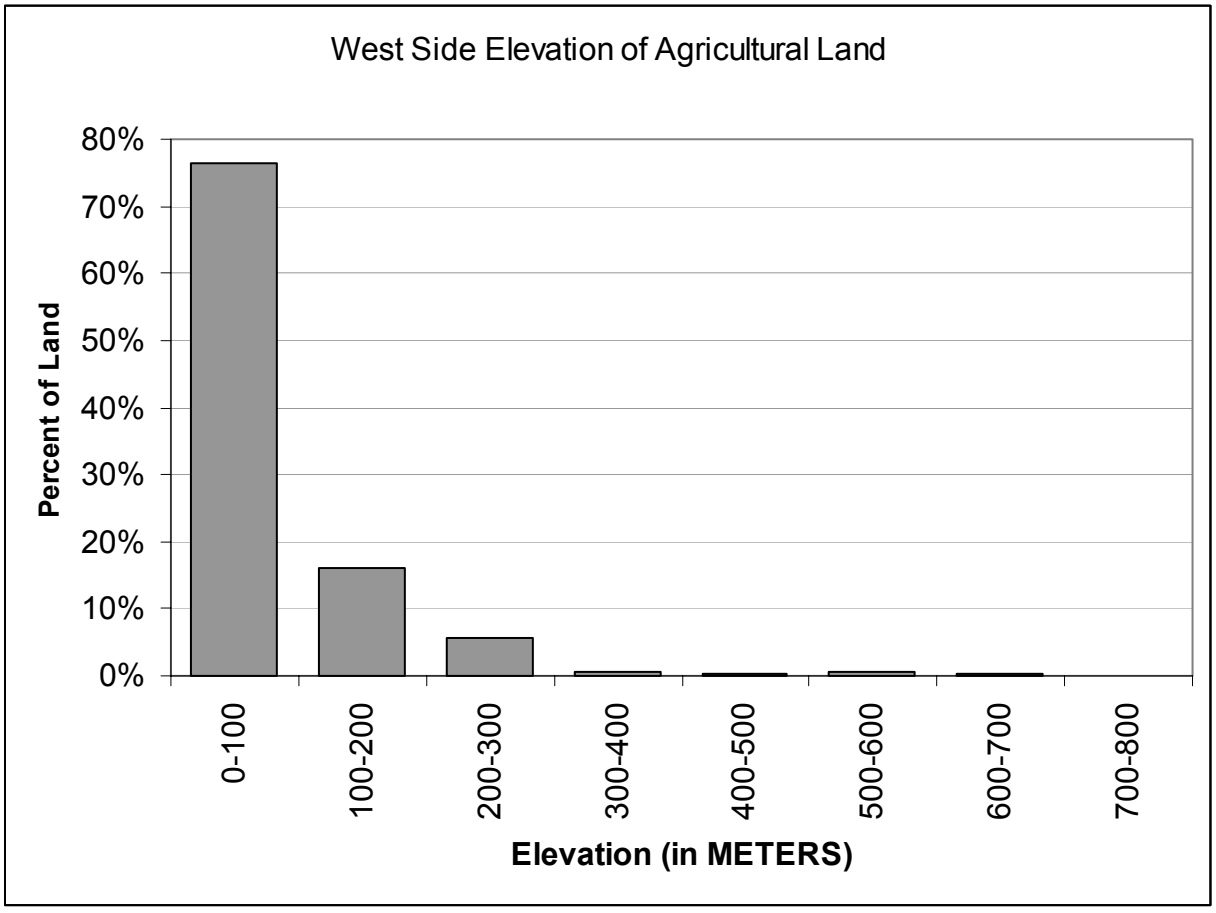


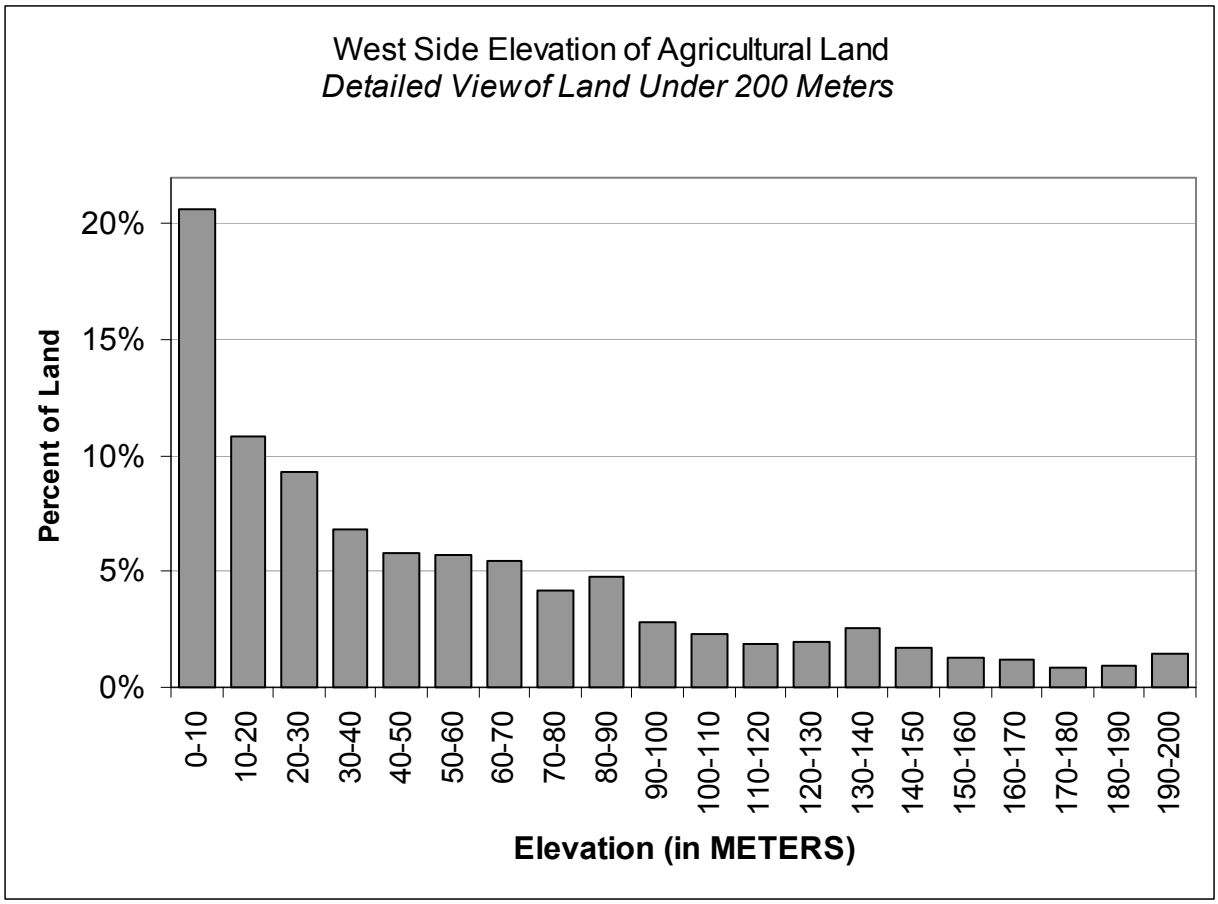
Elev (m) Range	Count	Percent of Count
0-100	10,114	0.03%
100-200	979,308	3.23%
200-300	3,153,089	10.4%
300-400	4,670,767	15.4%
400-500	3,992,168	13.2%
500-600	4,911,716	16.2%
600-700	4,274,477	14.1%

700-800	6,070,211	20.0%
800-900	1,635,098	5.4%
900-1000	343,737	1.1%
1000-1100	164,469	0.5%
1100-1200	61,523	0.2%
1200-1300	25,741	0.1%
1300-1400	7,395	0.024%
1400-1500	1,094	0.0036%
1500-1600	173	0.00057%
1600-1700	69	0.00023%
1700-1800	20	0.00007%
1800-1900	6	0.00002%

Summary of Results – West Side Data

Average West Side Elevation: 73 Meters





Elev (m) Range	Count	Percent of Count
0-100	2,426,074	76%
100-200	512,356	16%
200-300	179,800	5.7%
300-400	19,131	0.60%
400-500	13,726	0.43%
500-600	18,837	0.59%
600-700	5,189	0.16%
700-800	2,413	0.08%
800-900	221	0.0070%
900-1000	141	0.0044%
1000-1100	149	0.0047%
1100-1200	82	0.0026%
1200-1300	46	0.0014%
1300-1400	26	0.0008%
1400-1500	3	0.00009%
1500-1600	2	0.00006%

Elev (m) Range	Count	Percent of Count
0-10	656,403	21%
10-20	344,961	11%
20-30	294,116	9%
30-40	217,626	7%
40-50	184,210	6%
50-60	181,574	6%
60-70	174,685	5%
70-80	131,743	4%
80-90	150,993	5%
90-100	89,763	3%
100-110	74,110	2%
110-120	59,561	2%
120-130	62,717	2%
130-140	81,677	3%
140-150	53,721	2%
150-160	40,652	1%
160-170	38,259	1%
170-180	28,218	1%
180-190	28,604	1%
190-200	44,837	1%

Meters-to-Feet Cheat Sheet:

Meters	Feet
0	0
100	328
200	656
300	984
400	1312
500	1640
600	1969
700	2297
800	2625
900	2953
1000	3281
1100	3609
1200	3937
1300	4265
1400	4593
1500	4921
1600	5249
1700	5577
1800	5906
1900	6234
2000	6562
73	240
541	1775

Notes and Caveats for All Data:

1. Elevation data was from 30-meter DEMs. Elevations were analyzed in 100-meter increments, except elevations below 200 meters on the west side. The west side data below 200 meters were analyzed in 10-meter increments.

2. Land Use data came from EPA/USGS's NLCD Land Cover Classification System. The accuracy and currency of their data was not evaluated. (See http://aww.ecology/services/gis/gis_meta/lulc/mrlc.htm for more information) The following categories were considered to be "Agriculture"

   61. Orchards/Vineyards/Other - Orchards, vineyards, and other areas planted or maintained for the production of fruits, nuts, berries, or ornamentals.

   81. Pasture/Hay - Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops.

82. Row Crops - Areas used for the production of crops, such as corn, soybeans, vegetables, tobacco, and cotton.

83. Small Grains - Areas used for the production of graminoid crops such as wheat, barley, oats, and rice.

84. Fallow - Areas used for the production of crops that are temporarily barren or with sparse vegetative cover as a result of being tilled in a management practice that incorporates prescribed alternation between cropping and tillage.

Two other possible categories, "Grasslands/Herbaceous" and "Urban/Recreational Grasses," were not considered to be agriculture. While both of these categories include some agriculture, a large amount of the land in these categories would probably not be considered agricultural.

3. The accuracy of this elevation analysis was not determined. Therefore, outlier data should be treated cautiously. Specifically, the maximum elevation of agriculture (i.e. the counts at higher elevations) may be suspect. It is unknown if the very small percentages of agricultural practices at these elevations are real, or if they are some sort of data error. (A total of 16 billion data points were analyzed, and elevations over 1300 meters accounted for only 9,000 data points.)

December 19, 2002

TO: File

FROM: Dave Peeler

SUBJECT: The effect of changes to the state water quality standards on forest practices for the purposes of the Small Business Economic Statement

Minimal effect

One of the purposes of the Clean Water Act is to protect beneficial uses, which include those aquatic species that depend on clean, cold water for survival. The Forests and Fish Report has the same goal, focused specifically on protecting Washington's fish and riparian-dependent amphibians. The state water quality standards define the condition of the water that is necessary to protect beneficial uses. The new forest practices rules were designed to meet the requirements of the Clean Water Act and the Forests and Fish Report, and codify the best management practices necessary to meet the state water quality standards in the forest environment.

The new standards will lower the maximum temperature allowed by one degree in most places and by three to four degrees in streams that provide Char spawning and rearing habitat. While this is a significant change, it should be noted that the standards are designed to protect the same fish and amphibians as are covered by the forest practices rules, along with many other beneficial uses that depend on cold, clean water.

The forest practices rules contain a set of specific prescriptions that must be followed to protect riparian areas, designed to provide shade, to allow the recovery of a naturally functioning riparian zone, and to prevent sediments or forest chemicals from polluting surface waters. The rules are based on our best scientific assumptions about how the forest ecosystem works and what fish and amphibians need. The rules were designed to allow for change over time through an adaptive management process, as we test our assumptions and gain more knowledge. If in the future the Forest Practices Board finds that the current forest practices rules need to be modified based on the results of the adaptive management process, the Board will determine what changes need to be made to the rules. The Board must also determine at that time whether the proposed new rules will provide compliance with the Endangered Species Act, restore and maintain riparian habitat to support a harvestable supply of fish, meet the requirements of the Clean Water Act, and keep the timber industry viable in the state of Washington. The state Administrative Procedures Act requires that an economic analysis be prepared every time the forest practices rules are changed.

Because the forest practices rules were designed to minimize the effects of forest practices on the habitat of aquatic species and water quality, and because the new water quality standards are designed to do the same thing, the two rules are complementary. In fact, at this time, there is no evidence that the forest practices rules will have to be changed in any way to meet the new water quality standards. While adoption of new standards will change the outcome we are measuring against, it will not change the methods we use to achieve the outcome. Therefore, we expect that the new water quality standards will not result in any change in the forest practices rules, and, at

most, will result in a few more trees being left in the first 75 feet of the riparian zone, where very little harvest is taking place now because of current shade requirements.

Mitigating measures

Although we expect the new water quality standards to have little or no effect on the forest practices rules, for either large or small businesses, the legislature and the Forest Practices Board have already taken steps to minimize the economic impacts of the forest practices rules on small forest landowners.

- The forest practices rules established a forest riparian easement program, under which small forest landowners may be compensated for between 50 and 100% of the market value of the timber they are unable to harvest due to restrictions in the rules.
- Small forest landowners are subject to far less rigorous road maintenance and abandonment planning requirements than the larger landowners, and are not held to the same short term timelines for bringing their roads up to standards.
- Forest landowners are able to use an alternate planning process to harvest timber using prescriptions that differ from those in the rules as long as it is determined that those methods provide equal protection of riparian functions.
- Forest landowners, regardless of size, receive a reduction of 0.8 percent in the timber tax applied to each timber harvest that complies with the aquatic forest practices rules that apply to that harvest.

Conclusion

No economic analysis of the effect of the change in water quality standards on the forest practices rules is required as part of the adoption of the new water quality standards because: (1) we expect that the effect of the standards change will be minimal; (2) the forest practices rules already have mechanisms in place to mitigate any economic costs to landowners; and (3) the forest practices rules were designed to change through time using the Administrative Procedures Act process that includes an economic analysis of those changes by the Forest Practices Board.

Appendix D

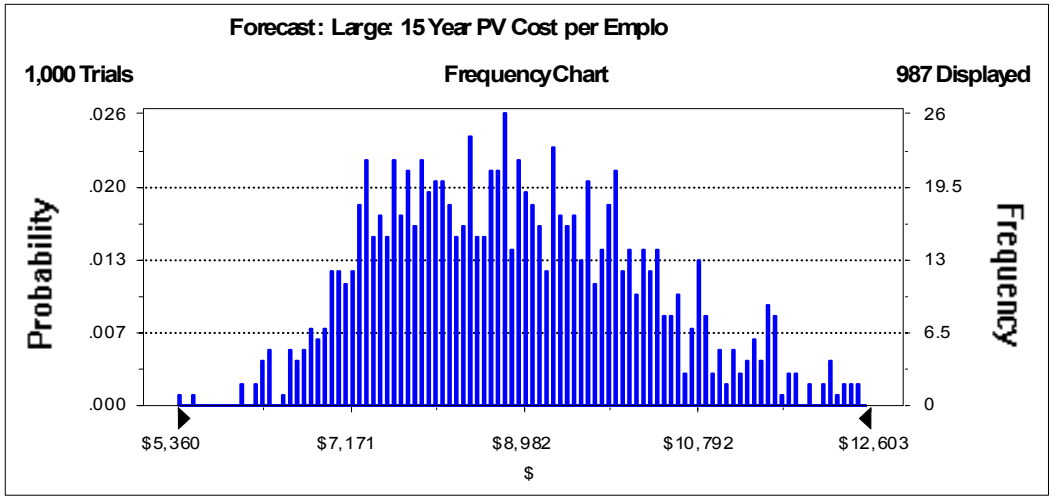
Monte Carlo
Worst Case Analysis
Sensitivity Test

Crystal Ball Report
Simulation started on 12/13/02 at 10:49:57
Simulation stopped on 12/13/02 at 10:50:08

Forecast: Large: 15 Year PV Cost per Emplo **Cell: B19**

Summary:
Display Range is from $5,360 to $12,603 $
Entire Range is from $5,360 to $14,265 $
After 1,000 Trials, the Std. Error of the Mean is $45

Statistics:	Value
Trials	1000
Mean	$8,936
Median	$8,803
Mode	---
Standard Deviation	$1,416
Variance	$2,005,365
Skewness	0.54
Kurtosis	3.16
Coeff. of Variability	0.16
Range Minimum	$5,360
Range Maximum	$14,265
Range Width	$8,905
Mean Std. Error	$44.78



Forecast: Large: 15 Year PV Cost per Emplo (cont'd) **Cell: B19**

Percentiles:

Percentile	$
0%	$5,360
10%	$7,269
20%	$7,655
30%	$8,034
40%	$8,424
50%	$8,803
60%	$9,187
70%	$9,636
80%	$10,095
90%	$10,827
100%	$14,265

End of Forecast

Forecast: Small: 15 year PV Cost per Employee **Cell: C19**

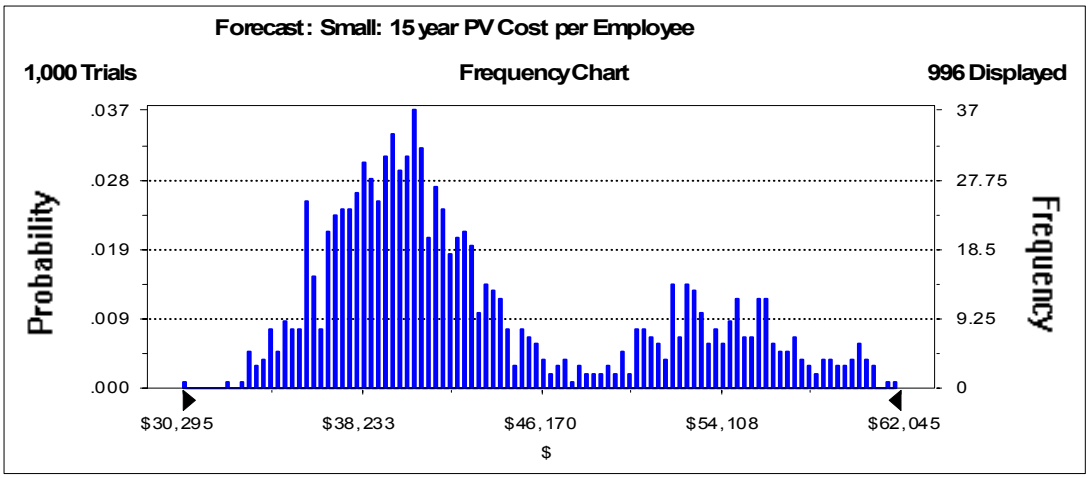
Summary:

Display Range is from $30,295 to $62,045 $

Entire Range is from $30,295 to $65,079 $

After 1,000 Trials, the Std. Error of the Mean is $225

Statistics:	Value
Trials	1000
Mean	$43,704
Median	$41,106
Mode	---
Standard Deviation	$7,125
Variance	$50,765,040
Skewness	0.87
Kurtosis	2.61
Coeff. of Variability	0.16
Range Minimum	$30,295
Range Maximum	$65,079
Range Width	$34,784
Mean Std. Error	$225.31



Forecast: Small: 15 year PV Cost per Employee (cont'd) **Cell: C19**

Percentiles:

Percentile	$
0%	$30,295
10%	$36,577
20%	$37,984
30%	$39,172
40%	$40,164
50%	$41,106
60%	$42,642
70%	$44,717
80%	$51,963
90%	$55,312
100%	$65,079

End of Forecast

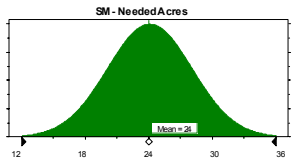
Assumptions

Assumption: SM - Needed Acres **[Cases for SBEIS 12 12 02.xls]SM - Cell: B6**

Normal distribution with parameters:

Mean	24
Standard Dev.	4

Selected range is from -Infinity to +Infinity

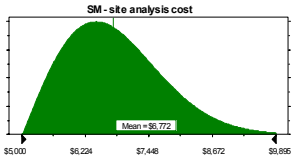


Assumption: SM - site analysis cost **[Cases for SBEIS 12 12 02.xls]SM - Cell: E13**

Weibull distribution with parameters:

Location	$5,000
Scale	$2,000
Shape	2

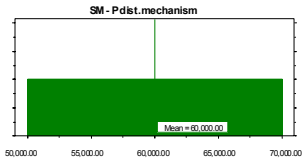
Selected range is from $5,000 to +Infinity



Assumption: SM - P dist. mechanism **[Cases for SBEIS 12 12 02.xls]SM - Cell: B27**

Uniform distribution with parameters:

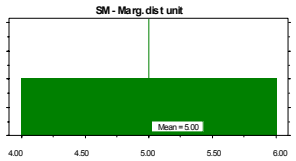
Minimum	50,000.00
Maximum	70,000.00



Assumption: SM - Marg. dist unit **[Cases for SBEIS 12 12 02.xls]SM - Cell: C29**

Uniform distribution with parameters:

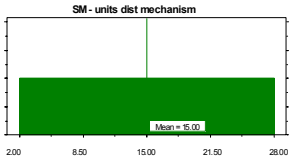
Minimum	4.00
Maximum	6.00



Assumption: SM - units dist mechanism **[Cases for SBEIS 12 12 02.xls]SM - Cell: C28**

Uniform distribution with parameters:

Minimum	2.00
Maximum	28.00

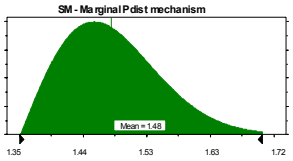


Assumption: SM - Marginal P dist mechanism **[Cases for SBEIS 12 12 02.xls]SM - Cell: C30**

Weibull distribution with parameters:

Location	1.35
Scale	0.15
Shape	2

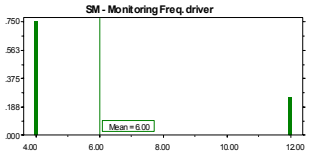
Selected range is from 1.35 to 1.70



Assumption: SM - Monitoring Freq. driver **[Cases for SBEIS 12 12 02.xls]SM - Cell: F41**

Custom distribution with parameters:

		Relative Prob.
Single point	4.00	0.750000
Single point	12.00	0.250000
Total Relative Probability		1.000000



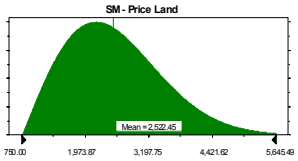
Assumption: SM - Price Land **[Cases for SBEIS 12 12 02.xls]SM - Cell: G6**

Weibull distribution with parameters:

Location	750.00
Scale	2,000.00
Shape	2

Selected range is from -3,179,250.00 to +Infinity

Assumption: SM - Price Land (cont'd) **[Cases for SBEIS 12 12 02.xls]SM - Cell: G6**

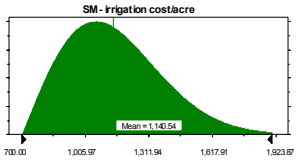


Assumption: SM - irrigation cost/acre **[Cases for SBEIS 12 12 02.xls]SM - Cell: B15**

Weibull distribution with parameters:

Location	700.00
Scale	500.00
Shape	2

Selected range is from 700.00 to 1,903.48

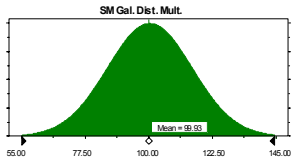


Assumption: SM Gal. Dist. Mult. **[Cases for SBEIS 12 12 02.xls]SM - Cell: B16**

Normal distribution with parameters:

Mean	100.00
Standard Dev.	15.00

Selected range is from -Infinity to 144.40

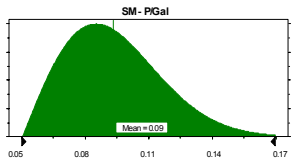


Assumption: SM - P/Gal **[Cases for SBEIS 12 12 02.xls]SM - Cell: B17**

Weibull distribution with parameters:

Location	0.05
Scale	0.05
Shape	2

Selected range is from 0.05 to 0.17

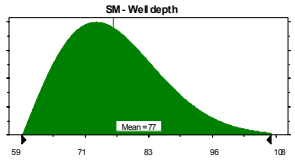


Assumption: SM - Well depth **[Cases for SBEIS 12 12 02.xls]SM - Cell: B19**

Weibull distribution with parameters:

Location	59
Scale	20
Shape	2

Selected range is from 59 to 107

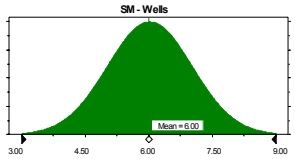


Assumption: SM - Wells **[Cases for SBEIS 12 12 02.xls]SM - Cell: B18**

Normal distribution with parameters:

Mean	6.00
Standard Dev.	1.00

Selected range is from 3.00 to 9.00

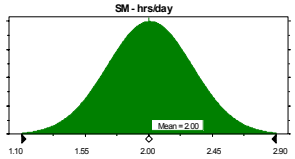


Assumption: SM - hrs/day **[Cases for SBEIS 12 12 02.xls]SM - Cell: C33**

Normal distribution with parameters:

Mean	2.00
Standard Dev.	0.30

Selected range is from -Infinity to +Infinity

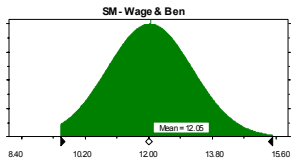


Assumption: SM - Wage & Ben **[Cases for SBEIS 12 12 02.xls]SM - Cell: C34**

Normal distribution with parameters:

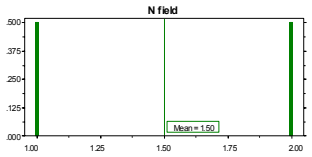
Mean	12.00
Standard Dev.	1.20

Selected range is from 9.50 to 15.50



Assumption: N field **[Cases for SBEIS 12 12 02.xls]SM - Cell: E100**

Custom distribution with parameters:		Relative Prob.
Single point	1.00	0.500000
Single point	2.00	0.500000
Total Relative Probability		1.000000

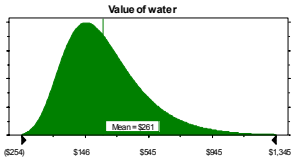


Assumption: Value of water **[Cases for SBEIS 12 12 02.xls]temp limited - Cell: M19**

Extreme Value distribution with parameters:

Mode	$146
Scale	$200

Selected range is from -Infinity to +Infinity

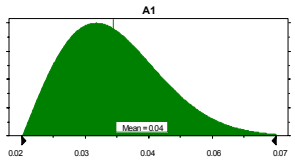


Assumption: A1 **[Cases for SBEIS 12 12 02.xls]pv - Cell: A1**

Weibull distribution with parameters:

Location	0.02
Scale	0.02
Shape	2

Selected range is from 0.02 to +Infinity



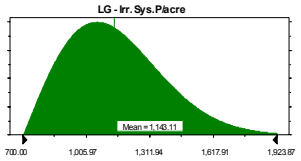
Assumption: LG - Irr. Sys. P/acre **[Cases for SBEIS 12 12 02.xls]LG - Cell: B5**

Weibull distribution with parameters:

Location	700.00
Scale	500.00
Shape	2

Selected range is from 700.00 to +Infinity

Assumption: LG - Irr. Sys. P/acre (cont'd) **[Cases for SBEIS 12 12 02.xls]LG - Cell: B5**

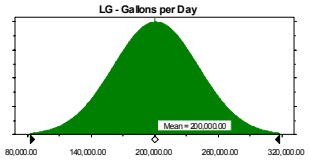


Assumption: LG - Gallons per Day **[Cases for SBEIS 12 12 02.xls]LG - Cell: B12**

Normal distribution with parameters:

Mean	200,000.00
Standard Dev.	40,000.00

Selected range is from 82,400.00 to 317,600.00

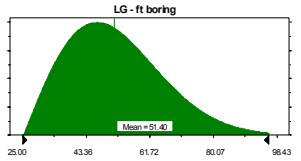


Assumption: LG - ft boring **[Cases for SBEIS 12 12 02.xls]LG - Cell: D19**

Weibull distribution with parameters:

Location	25.00
Scale	30.00
Shape	2

Selected range is from 25.00 to 95.98

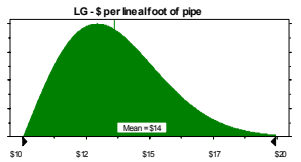


Assumption: LG - $ per lineal foot of pipe **[Cases for SBEIS 12 12 02.xls]LG - Cell: B22**

Weibull distribution with parameters:

Location	$10
Scale	$4
Shape	2

Selected range is from $10 to $20

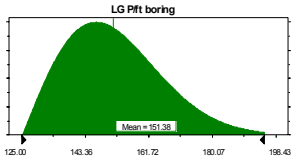


Assumption: LG P/ft boring **[Cases for SBEIS 12 12 02.xls]LG - Cell: D20**

Weibull distribution with parameters:

Location	125.00
Scale	30.00
Shape	2

Selected range is from 125.00 to 195.01

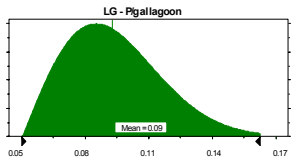


Assumption: LG - P/gal lagoon **[Cases for SBEIS 12 12 02.xls]LG - Cell: D30**

Weibull distribution with parameters:

Location	0.05
Scale	0.05
Shape	2

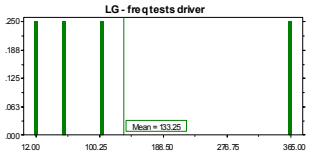
Selected range is from 0.05 to 0.16



Assumption: LG - freq tests driver **[Cases for SBEIS 12 12 02.xls]LG - Cell: E51**

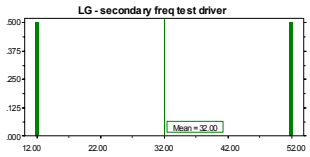
Custom distribution with parameters:

		Relative Prob.
Single point	12.00	0.250000
Single point	52.00	0.250000
Single point	104.00	0.250000
Single point	365.00	0.250000
Total Relative Probability		1.000000



Assumption: LG - secondary freq test driver **[Cases for SBEIS 12 12 02.xls]LG - Cell: E55**

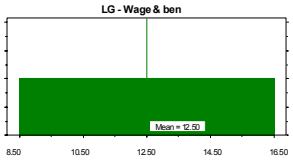
Custom distribution with parameters:		Relative Prob.
Single point	12.00	0.500000
Single point	52.00	0.500000
Total Relative Probability		1.000000



Assumption: LG - Wage & ben **[Cases for SBEIS 12 12 02.xls]LG - Cell: E43**

Uniform distribution with parameters:

Minimum	8.50
Maximum	16.50

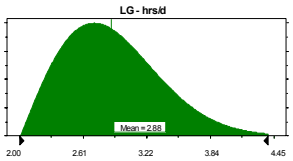


Assumption: LG - hrs/d **[Cases for SBEIS 12 12 02.xls]LG - Cell: E42**

Weibull distribution with parameters:

Location	2.00
Scale	1.00
Shape	2

Selected range is from 2.00 to 4.39

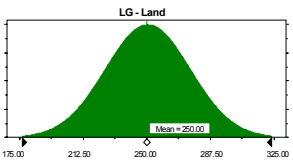


Assumption: LG - Land **[Cases for SBEIS 12 12 02.xls]LG - Cell: B4**

Normal distribution with parameters:

Mean	250.00
Standard Dev.	25.00

Selected range is from 176.50 to 323.50

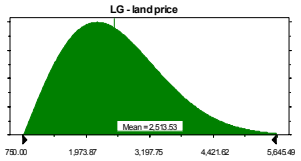


Assumption: LG - land price **[Cases for SBEIS 12 12 02.xls]LG - Cell: F4**

Weibull distribution with parameters:

Location	750.00
Scale	2,000.00
Shape	2

Selected range is from 750.00 to 5,629.18

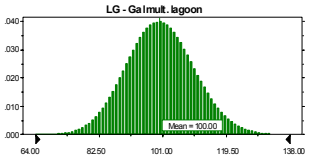


Assumption: LG - Gal mult. lagoon **[Cases for SBEIS 12 12 02.xls]LG - Cell: D29**

Poisson distribution with parameters:

Rate	100.00

Selected range is from 0.00 to +Infinity

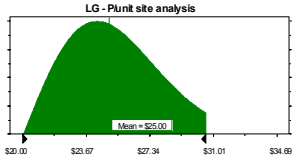


Assumption: LG - P/unit site analysis **[Cases for SBEIS 12 12 02.xls]LG - Cell: B7**

Weibull distribution with parameters:

Location	$20.00
Scale	$6.00
Shape	2

Selected range is from $14.00 to $30.57

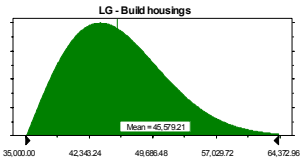


Assumption: LG - Build housings **[Cases for SBEIS 12 12 02.xls]LG - Cell: D24**

Weibull distribution with parameters:

Location	35,000.00
Scale	12,000.00
Shape	2

Selected range is from 35,000.00 to 64,177.14

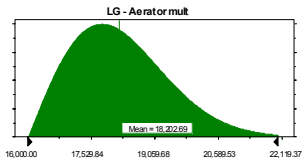


Assumption: LG - Aerator mult **[Cases for SBEIS 12 12 02.xls]LG - Cell: D31**

Weibull distribution with parameters:

Location	16,000.00
Scale	2,500.00
Shape	2

Selected range is from 16,000.00 to 22,017.38



End of Assumptions